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(54) **CAMERA SYSTEM AND VEHICLE**

(56) **References Cited**

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U.S. PATENT DOCUMENTS

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5,179,470	A *	1/1993	Olson	B60R 1/0602
					359/507
6,793,416	B2 *	9/2004	Peterson	G03B 17/02
					348/143
2003/0155001	A1 *	8/2003	Hoetzer	.....	B60S 1/0822
					134/37
2007/0291130	A1 *	12/2007	Broggi	.....	G01S 17/023
					348/218.1
2012/0176532	A1 *	7/2012	Hara	.....	G03B 13/36
					348/352
2012/0268599	A1 *	10/2012	Schmidt	.....	B60R 1/00
					348/148
2013/0002936	A1 *	1/2013	Hirama	.....	H04N 5/23212
					348/349
2013/0215271	A1 *	8/2013	Lu	H04N 7/18
					348/148
2014/0104426	A1 *	4/2014	Boegel	B60R 1/00
					348/148

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* cited by examiner

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See application file for complete search history.

(57) **ABSTRACT**

A camera system for a vehicle includes a body defining a cavity therein, and a camera including a lens. The camera is disposed in a deployed position such that the lens protrudes from the cavity. The camera system includes a debris region covering the lens and a duct disposed within the cavity. The duct defines a channel therein and has a first end spaced apart from the camera and a second end spaced apart from the first end. The duct is configured for directing an airstream through the channel from the first end to the debris region. A vehicle including the camera system is also disclosed.

15 Claims, 4 Drawing Sheets

